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(54) DISINFECTANT COMPOSITIONS

(71) We, COALITE AND CHEMICAL PRODUCTS LIMITED, a British Company, of Buttermilk Lane, Bolsover, Near Chesterfield, Derbyshire, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The invention relates to a disinfectant composition.

It is an object of the invention to provide a disinfectant composition or concentrate which remains substantially clear over a range of atmospheric temperatures and which also remains clear upon dilution with tap water.

A further object of the invention is to provide an aqueous disinfectant composition which in dilute form is suitable for use in hospitals.

According to the invention there is provided a disinfectant composition comprising an aqueous solution of a phenolic component and a surface active component, the phenolic component comprising one or more alkylphenols, preferably xylenols, with one or both of an aralkyl-substituted halophenol, preferably an aralkyl chlorophenol, and an arylphenol, preferably a phenylphenol; and the surface active component comprising an anionic non-soap surface active agent which is one or more of a secondary alcohol sulphate, a salt of a sulphate of a C_6—C_{18} fatty alcohol ethoxylate and an alkaryl sulphonate. The phenolic component preferably includes both the aralkylhalophenol and the arylphenol.

The phenolic component advantageously contains, by weight, one part of arylphenol, 0.75—2 parts, preferably 1—1.5 parts, of aralkylhalophenol, and 1—10 parts, preferably 2—7 parts, of alkylphenol. The preferred aralkylhalophenol is *o* - benzyl - *p* - chlorophenol and the preferred arylphenol is *o*-phenylphenol.

A mixture of xylenols is preferably used as the alkylphenol constituent and the xylenol mixture preferably has an initial boiling point of not below 218°C, the xylenol mixture being suitably a tar acid fraction. A preferred xylenol mixture has a boiling range of 218—235°C, particularly a xylenol fraction derived from the products of the low temperature carbonisation of coal. A xylenol fraction having an initial boiling point below 218°C may have a necrotic effect on the skin.

The surface active component, which must be compatible with the remainder of the composition, includes a non-soap surface active agent and, preferably, also a soap. The non-soap surface active agent is anionic. A preferred surface active agent comprises secondary alcohol sulphates (secondary alkyl sulphates) such as are available under the Registered Trade Mark "Teepol". Thus "Teepol 610" is particularly suitable, Teepol 610 being the sodium salts of secondary C_6—C_{18} alkyl sulphates. A further preferred surface active agent is a salt of a sulphate of C_8—C_{19}, preferably C_{12}—C_{15}, synthetic fatty alcohol ethoxylates, particularly a primary alcohol ether containing 1—20 moles of ethylene oxide per mole of fatty alcohol. An example of such surfactant is the lauryl ether sulphate sodium salt which is available on the market under the name "Perlankrol E.S.D. 60". Other very useful surface active agents are alkaryl sulphonate detergents, particularly alkylbenzene and alkylnaphthalene sulphonates, and more especially alkylbenzene sulphonates containing from 8 to 16 carbon atoms in the alkyl group. The sulphonates are suitably alkali metal, ammonium or amine salts, and the alkyl group is preferably a straight rather than a branched chain. A particularly suitable alkaryl sulphonate is n-dodecylbenzene sulphonate, for example, the sodium salt.

As hereinbefore stated, the surface active component preferably also includes a soap. Preferred soaps include salts, for example alkali metal and aliphatic amine salts, of aliphatic or alicyclic carboxylic acids having from 10 to 30 carbon atoms in the molecule, and salts of sulphonated oils. A particularly suitable soap is castor oil soap. The soap suitably forms a minor proportion of the surface active component. The small amount of soap functions as a good solubiliser for the phenolic component

and its presence tends to lead to an increase in the kill against *Staphylococcus aureus*. The surface active component may also contain other compatible members.

The surfactant component suitably comprises, by weight, (a) 1—6 parts, preferabiy 1—3 parts, of secondary alkyl sulphate, (b) 0—5 parts, preferably 1—3 parts, of the sulphate or sulphonate of a C_8—C_{18} fatty alcohol ethoxylate and/or of an alkaryl sulphonate, and (c) 0—1.5 parts, preferably 0.2—0.75 parts, of soap.

Another suitable surface active component comprises, by weight, (a) 1—6 parts, preferably 1—3 parts, of a secondary alkyl sulphate and/or of an alkaryl sulphonate, (b) 0—5 parts, preferably 1—3 parts, of a sulphate of a C_8—C_{18} fatty alcohol ethoxylate and (c) 0—1.5 parts, preferably 0.2—0.75 part, of a soap.

The composition suitably contains 1—3, preferably 1—1.5, parts by weight of the phenolic component and 0.5—4, preferably 1—2, parts by weight of the surface active component.

The composition preferably also contains a water-miscible alcohol to assist in solubilising the phenols in the water. The water-miscible alcohol is preferably an alkanol and is suitably isopropanol, but it will be understood that it can be another water-miscible alkanol, for example ethanol or methanol. Advantageously, 0.5—2 parts by weight, preferably 0.8—1.5 parts by weight, of the water-miscible alcohol are used per part by weight of the phenolic component.

The disinfectant composition is preferably prepared as a concentrate suitably containing less than 50%, and preferably not more than 40%, by weight of water. The water used in preparing the concentrate may conveniently be distilled water or de-ionised water, but it will be understood that tap water may also be used. The concentrate will be diluted as required before use, for example, by adding one volume of the concentrate to 100 volumes of water.

The lowest temperature at which the concentrate still remains clear may be adjusted over an appreciable range by varying the proportions of the ingredients. Such adjustment may be readily effected by trial and error without any undue loss in bactericidal activity.

The clear concentrate gives a clear product on dilution and the diluted product may be applied through a spray without difficulty. When a similar but cloudy diluted product is applied through a spray, it may give rise to difficulty and the nozzle of the atomiser or spray may become partly or completely blocked. The clarity of the composition also has aesthetic value in appropriate circumstances, for example when in use in hospitals. Cloudiness may also result in some loss of activity so that clarity indicates that the composition is fully or uniformly active.

Suitable concentrates according to the invention comprises the following ingredients:

10—25% by weight of a mixture of xylenols having an initial boiling point not lower than 218°C.
1—7.5% by weight of *o*-benzyl-*p*-chlorophenol,
1—7.5% by weight is *o*-phenylphenol.
10—25% by weight of a water-miscible alcohol, preferably isopropanol.
7.5—20% by weight of an alkyl ether sulsulphate sodium salt.
7.5—20% by weight of a secondary alcohol sulphate.
2.5—7.5% by weight of a castor oil soap (30% strength).
Water to 100%.

A portion of one or both of the non-soap, surface active agents may be replaced by an alkylbenzene sulphonate or one of the two may be wholly replaced by the alkylbenzene sulphonate.

The invention is illustrated in the following examples.

EXAMPLE 1.

The disinfectant composition consisted of the following ingredients, the percentages being by weight:—

18%	xylenols
3.5%	*o*-benzyl-*p*-chlorophenol
3.5%	*o*-phenylphenol
20.0%	isopropanol
12.5%	Perlankrol E.S.D. 60
12.5%	Teepol 610
5.0%	castor oil soap
25.0%	distilled water

The xylenols consisted of a tar acid fraction having a boiling range of 218—235°C and which was isolated from the products of the low temperature carbonisation of coal.

The castor oil soap was of 30% strength (contained 30% castor oil).

The composition remained clear at 0°C.

The biocidal properties of the composition were tested under the following condition:—

Disinfectant time — 1 min. 2 mins. 2½ and 5 mins.
Dilutions — 1 in 100 tap water
Temperature — 22°C
Test organisms —

Staphylococcus aureus NCTC 4163
Escherichia coli NCTC 86
Proteus vulgaris NCTC 4175
Pseudomonas pyocyanea NCTC 6749

Organic matter — 10% whole milk
Inactivator — 10% Tween 80 (TWEEN is a registered Trade Mark)
Control Count — 4×10^6

The results obtained are shown in the following Table 1 together with the results obtained with two of the test organisms at dilutions of 1 in 150 tap water and 1 in 200 tap water.

TABLE 1

Dilution	% Kill of:–							
	NCTC 4163 Staph. Aureus		NCTC 86 E. Coli		NCTC 4175 Pr. Vulgaris		NCTC 6749 Ps' Pyoc yanea	
	1 min.	2 mins.	1 min.	2 mins.	1 min.	2 mins.	2½ mins.	5 mins.
1:100	98.08	99.99	99.82	99.99	99.99	99.99	98.89	99.99
1:150	75.5	94.75	94.5	99.99	–	–	–	–
1:200	53.9	70.4	51.5	72.3	–	–	–	–

The most resistant of the four organisms was Ps pyocyanea NCTC 6749.

The disinfectant composition was also subjected to the capacity test method of Kelsey and Sykes (1969 Pharmaceutical Journal, *202*, 607) and to the stability test method of Maurer (1969 Pharmaceutical Journal, *203*, 529), using Ps pyocyanea NCTC 6749 in both tests.

The disinfectant composition in a concentration of 1.0% (dilution 1 in 99 water) passed the capacity test under "clean" conditions but failed under "dirty" conditions. A concentration of 1.2% passed under "dirty" conditions.

The disinfectant composition in a concentration of 1% passed the stability test under "clean" conditions and passed under "dirty" conditions in a concentration of 1.2%.

EXAMPLE 2.

Example 1 was repeated except that the xylenol fraction, instead of being one derived from the products of the low temperature carbonisation of coal, was one derived from the products of the high temperature carbonisation of coal. The boiling range of the xylenol fraction used in this Example was 216°—218°C. The composition remained clear at 0°C.

The biocidal properties of the composition so obtained were tested in the manner described in Example 1, and they were found to be substantially the same as the biocidal properties of the composition described in Example 1.

EXAMPLES 3 to 15.

The composition of each of Examples 3 to 15 is given in percentages by weight in the following Table 2:—

TABLE 2

Ex	XYLS	OBPCP	OPP	IPA	IMS	SOAP	T610	ESD60	DISTD WATER
3	10	5	5	20	–	–	20	–	40
4	10	5	5	–	20	–	20	–	40
5	10	5	5	20	–	–	–	20	40
6	10	5	5	–	20	–	–	20	40
7	10	5	5	20	–	–	30	–	30
8	10	5	5	20	–	–	10	10	40
9	10	5	5	20	–	–	20	20	20
10	10	5	5	20	–	–	15	15	30
11	10	5	5	20	–	–	12.5	12.5	35
12	10	5	5	20	–	5	12.5	12.5	30
13	20	4.5	–	20	–	5	15	15	20.5
14	20	–	3.5	20	–	5	15	15	21 5
15	20	4.5	3.5	20	–	5	15	15	17

The abbreviations used in Table 2 have the following meanings:—

Ex — Example
Xyls — the xylenol mixture used in Example 1
OBPCP — *o*-benzyl-*p*-chlorophenol
OPP — *o*-phenylphenol
IPA — isopropanol
IMS — industrial methylated spirit
T610 — Teepol 610
ESD60 — Perlankrol E.S.D. 60

The soap was the grade of castor oil soap used in Example 1.

The compositions of Examples 3 to 11 were clear down to temperatures of 10°C, 12°C, 14°C, 16°C, 8°C, 10°C, 0°C, 0°C and 4°C respectively whilst the compositions of Examples 12 to 15 were each clear down to 0°C.

The 2-minute kills of the compositions of Example 11 against E. coli and S. aureus under the same conditions as in Example 1, with dilution at 1 in 100 tap water, were 98.25% and 79.0% respectively. By adding 5% of castor oil soap to give the composition of Example 12, the kill against S. aureus was raised to 99.88% and that against E. coli to 99.99%.

The compositions of Examples 9 and 10 were both clear at 0°C but crystal deposition tended to occur and the bactericidal properties against Ps pyocyanea were reduced. The deposited material was sodium sulphate which was present in ESD 60. The two compositions were modified by the addition of soap and by increasing the xylenol content, the former serving to prevent crystal deposition and the latter increasing the kill against Ps pyocyanea. The proportions of OBPCP, OPP, T610 and ESD60 were simultaneously adjusted, so giving the composition of Example 1.

The 2-minute kills of the compositions of Examples 13, 14 and 15 under the same conditions (dilution — 1 in 100 tap water) as in Example 1 against E. coli, S. aureus and P. pyocyanea are shown in Table 3.

TABLE 3

Example	E. coli	S. aureus	P. pycoyanea
13	99.99	99.54	99.99
14	99.99	99.60	99.99
15	99.99	99.99	99.99

EXAMPLE 16.

Example 1 was repeated except that the Perlankrol E.S.D. 60 was replaced by an equal amount by weight of Arylan SBC, the sodium salt of dodecylbenzene sulphonic acid in which the dodecyl group was a straight chain group. The biocidal properties of the composition, when tested as described in Example 1, were found to be substantially the same as the biocidal properties of the composition of Example 1. The composition remained clear at $-2°C$.

WHAT WE CLAIM IS:—

1. A disinfectant composition comprising an aqueous solution of a phenolic component and a surface active component, the phenolic component comprising one or more alkylphenols with one or both of an aralkyl halophenol and an arylphenol and the surface active component comprising an anionic non-soap surface active agent which is one or more of a secondary alcohol sulphate, a salt of a sulphate of a C_6—C_{18} fatty alcohol ethoxylate and an alkaryl sulphonate.

2. A composition, according to claim 1, in which the secondary alcohol sulphate is a secondary C_6—C_{10} alkyl sulphate.

3. A composition, according to either preceding claim, in which the said ethoxylate is an ethoxylate of a C_{12}—C_{15} fatty alcohol.

4. A composition, according to any preceding claim, in which the ethoxylate contains 1—20 moles of ethylene oxide per mole of fatty alcohol.

5. A composition, according to any preceding claim, in which the alkaryl sulphonate is an alkylbenzene sulphonate.

6. A composition, according to Claim 5, in which the alkylbenzene sulphonate is a dodecylbenzene sulphonate in which the dodecyl group is a straight chain.

7. A composition, according to any preceding claim, in which the surface active component comprises a soap.

8. A composition according to claim 7, in which the soap is a salt of C_{10}—C_{30} aliphatic or alicyclic carboxylic acid.

9. A composition according to claim 7, in which the soap is a salt of a sulphonated oil.

10. A composition according to any one of claims 7 to 9, in which the soap is an alkali metal or aliphatic amine salt.

11. A composition according to any one of claims 7 to 10, in which the surfactant component comprises, by weight, (a) 1—6 parts of secondary alcohol sulphate, (b) 0—5 parts of an alkaryl sulphonate and the salt of the sulphate or sulphonte of a C_6—C_{18} fatty alcohol ethoxylate and (c) 0—1.5 parts of soap.

12. A composition according to any one of claims 7 to 10, in which the surface active component comprises, by weight, (a) 1—6 parts of a secondary alcohol sulphate and an alkaryl sulphonate, (b) 0—5 parts the salt of a sulphate of a C_6—C_{18} fatty alcohol ethoxylate and (c) 0—1.5 parts of soap.

13. A composition according to claim 11 or claim 12, in which the surface active component comprises, by weight, 1.3 parts of (a) 1—3 parts of (b) and 0.2—0.75 part of (c).

14. A composition according to any one of the preceding claims, in which the alkylphenols are xylenols.

15. A composition according to claim 14, in which the xylenols are a tar acid fraction.

16. A composition according to claim 15, in which the tar acid fraction is one isolated from the products of the low temperature carbonisation of coal.

17. A composition according to claim 15, in which the initial boiling point of the tar acid fraction is not below 218°C.

18. A composition according to any one of the preceding claims, in which the aralkyl halophenol is an aralkyl chlorophenol.

19. A composition according to claim 18, in which the aralkyl chlorophenol is *o*-benzyl-*p*-chlorophenol.

20. A composition according to any one of the preceding claims, in which the arylphenol is *o*-phenylphenol.

21. A composition according to any one of the preceding claims, in which the phenolic component contains, by weight, 1 part of arylphenol, 0.75—2 parts of aralkylhalophenol and 1—10 parts alkylphenol.

22. A composition according to claim 21, in which the phenolic component contains, by weight, 1 part of arylphenol, 1—1.5 parts of aralkylhalophenol and 2—7 parts of alkylphenol.

23. A composition according to any preceding claim, in which 1—3 parts by weight of

phenolic component and 0.5—4 parts by weight of surface active component are present.

24. A composition according to claim 23, in which 1—1.5 parts by weight of phenolic component and 1—2 parts by weight of surface active component are present.

25. A composition according to any one of the preceding claims, including a water-miscible alcohol.

26. A composition according to claim 25, in which the alcohol is isopropanol.

27. A composition according to claim 25 or claim 26, in which 0.5—2 parts by weight of water-miscible alcohol are present per part by weight of the phenolic component.

28. A composition according to claim 27, in which 0.8—1.5 parts by weight of water-miscible alcohol are present per part by weight of the phenolic component.

29. A composition according to any one of claims 7 to 28, in which the soap is a castor oil soap.

30. A composition according to any one of the preceding claims, containing not more than 40% by weight of water.

31. A disinfectant composition substantially as hereinbefore described with reference to any one of the Examples.

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